Hearing Protection Devices (HPD's)

Roberta Hudak

Mining Hearing Loss Prevention Workshop

June 21-22, 2005

Outline

- Overview of Hearing Protectors (HPD's)
- Advantages/Disadvantages of HPD types
- Insertion method
- Noise reduction ratings
- Derating HPD's
- Dual Protection

Have you heard?

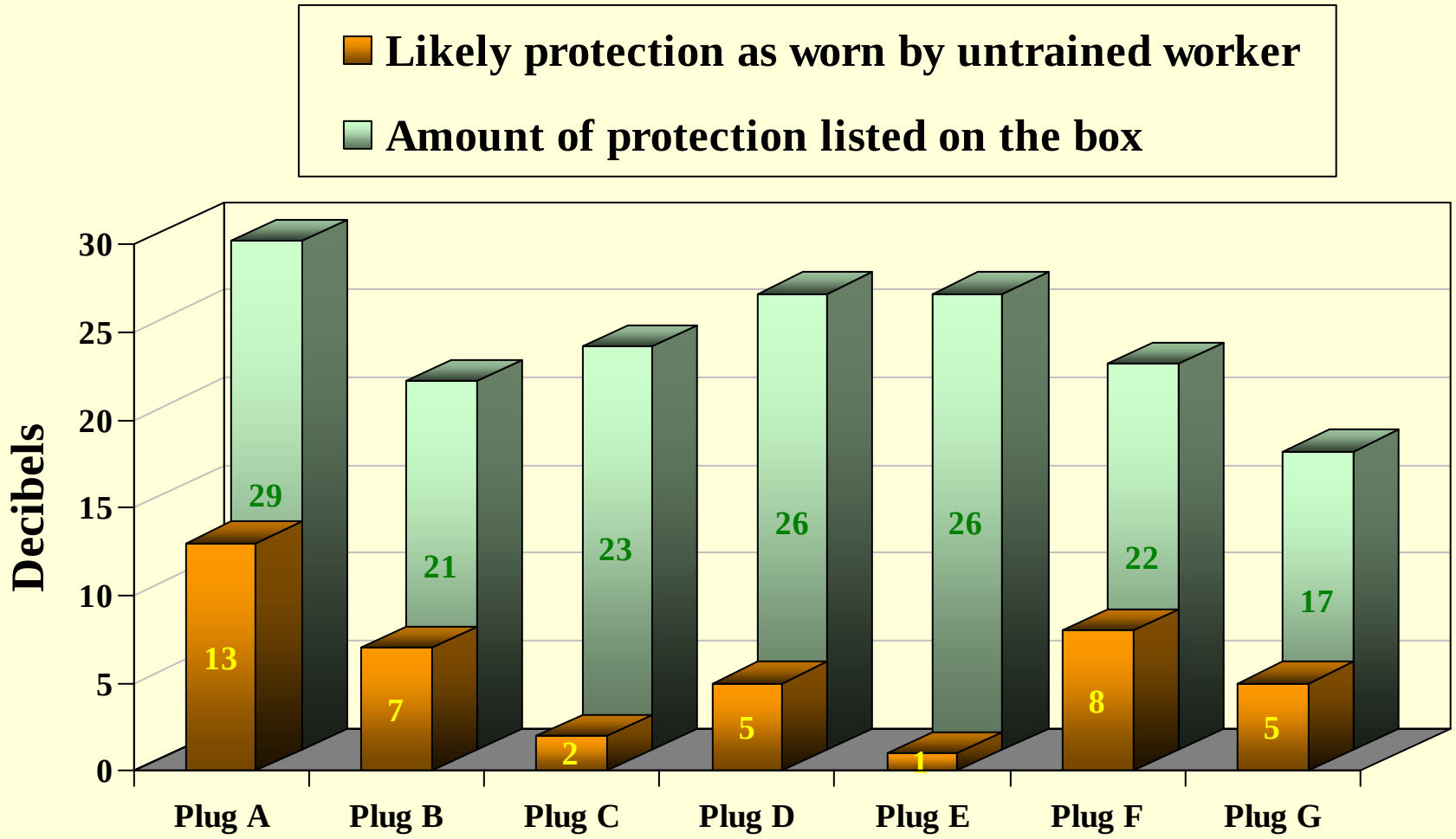
- To reduce noise exposure, remember 3 key points:
  - Less **Time**
  - Further **Distance**
  - Use **Shielding**--Equipment (barrier)
    Ear (HPD)

Hearing Loss Prevention Approaches

- Remove noise
- Remove worker

  then
- Protect the worker…use HPD's

Problem: Earplugs are rarely worn effectively



When to wear hearing protection

- If have to raise voice to speak to a person 2-3 feet away
- If your ears “ring” after noise exposure
- If after leaving the noise area, and sounds are “dull, flat or muffled”
- If noise is measured at 85dB(A) and above

Hearing protection-how does it work?

- A device worn to reduce (not eliminate) the level of sound entering the ear
- Considered last choice against hazardous noise
- Generally provide greatest protection from high frequency noise and less in low frequency noise

- To be **effective,** must fit properly

Hearing Protection Devices

Best protector-**REMOVE** noise

There is NO single “best” type for all individuals or situations.

- Varies with:
  - Individual comfort
  - Size of ear canals
  - Noise environments
  - Work activities
  - Environmental conditions

4 C ’s for Wearing HPD’s

- The “ **Best**” HPD is one that a worker will wear:
  - ***Clean*** - plugs & hands for insertion
  - ***Consistent*** - for levels 85 dB(A) and above
  - ***Correct*** - insertion method
  - ***Comfortable*** – for user, offer choices

**** Wear HPD’s “ *every time and all the time*” in hazardous noise**

How to make HPD's more effective

Even if a worker wears HPD's, they often do not wear it correctly

- Simplify insertion instructions
- Practice correct insertion method
- Train employee-care & use

Hearing Protection Devices

Factors determining worker acceptance of HPD's:

- Convenience, availability and choices
- Beliefs that the protector
  - Can be worn correctly
  - Will prevent hearing loss
  - Will *not* impair important sounds
- Comfort
- Adequate noise reduction
- Ease of fit
- Compatible with other personal protective equipment

Hearing Protection Devices
Foam Plugs

- ¼-½ inch foam/fiber- rolled, inserted and held (30–40 sec.) to expand, to fill ear canal
- Available in standard sizes
- Generally comfortable to wear
- Reusable on a limited basis
  - Not washable
  - Discard if wet, dirt or wax present

Hearing Protection Devices
Advantages & Disadvantages

Foam Plugs

Advantages:

- Small
- Inexpensive

  (10-20 cents/pkg), depending on type
- Portable
- Generally more comfortable than others
- Worn effectively without interference from hair or glasses

Disadvantages:

- Can be hard to fit, esp. small canals
- Can introduce dirt into canal
- Protection level can vary with:
  - canal anatomy
  - insertion method
  - wax/hair in canals

CDC NIOSH

Hearing Protection Devices
Proper Fit

- After the plug is inserted, check the fit. The body of the ear plug should be within the canal, and not visible from front view of person.

- Your own voice should sound muffled or hollow (like an echo or being in a tunnel).

- If proper fit was not obtained, remove plugs and re-insert with proper technique.

Proper Fit

Incorrect Fit

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Hearing Protection Devices

Molded/Pre-molded

- Soft, flexible devices (silicone/plastic/rubber) that fit into ear canal
- Variety of styles, some sized
- FLANGES provide seal against canal wall
- Re-useable ...retain size and flexibility, if kept clean daily with soap and water

CDC NIOSH

Hearing Protection Devices
Advantages & Disadvantages

Molded (flanged) plugs

Advantages:

- Stem for clean insertion
- Variety of sizes
- Carrying case-convenient
- Washable, re-useable

Disadvantages:

- May need different size for each ear and individual fit.

Critical Tip:

- Insert and remove with rotation/twisting motion
- Do not pull straight out upon removal

Hearing Protection Devices

Earmuffs

- Ear cushions that seal against head and directly over outer ear
- Made of smooth, plastic envelope filled with foam or fluid material
- Require periodic replacement (cushions become stiff or brittle)- **Inspect daily** for defects
- Easily seen for use/compliance at distances
- One size fits most
- Generally provide greater protection
- Can be uncomfortable in hot work areas, or vigorous work activity

CDC NIOSH

Hearing Protection Devices

Earmuffs

After inspection, reasons for replacement

CDC

NIOSH

Hearing Protection Devices
Advantages & Disadvantages

Earmuffs

Advantages:

- Easy to fit properly
- Designed to fit “most” people
- Less time & effort applying and fitting
- Easily visible/monitored
- Not misplaced/lost as easily

Disadvantages:

- Uncomfortable in hot environments
- May be cumbersome & restrict head motion
- Hair, beards, sideburns and glasses can alter protection
- Protection less in low frequency noise environment

Interventions and outreach with the Hearing Loss Prevention Unit

- Traveled to 42 sites nationwide
- Performed 5,414 series of tests on…
  - 3,609 workers
  - 1,914 miners

CDC

Updated: 6/16/2005

NIOSH

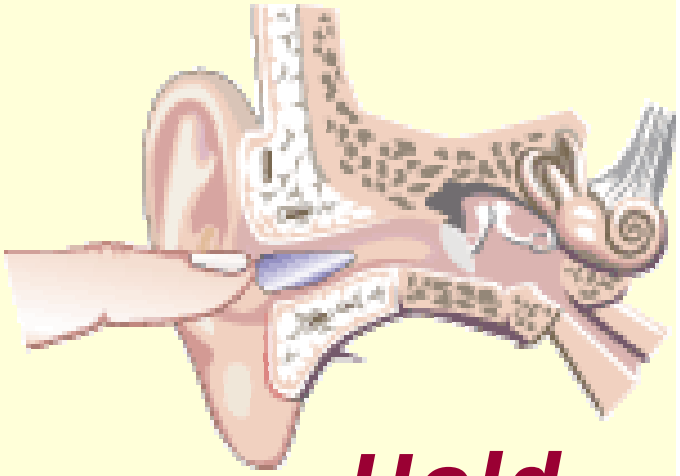
Roll-Pull-Hold earplug technique

You've heard of: *Stop, Drop, Roll*

Now there's ***Roll, Pull, Hold***

Roll

Pull



Hold

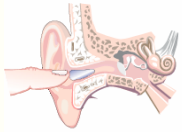
Simplify the instructions:

Putting in soft foam earplugs

To get the best protection from your soft foam earplugs, remember to ***roll***, ***pull***, and ***hold*** when putting them in. Use clean hands to keep from getting dirt and germs into your ears!

1. Roll the earplugs up into a small, thin "snake" with your fingers. You can use one or both hands.

2. Pull the top of your ear *up and back* with your opposite hand to straighten out your ear canal. The rolled-up earplug should slide right in.

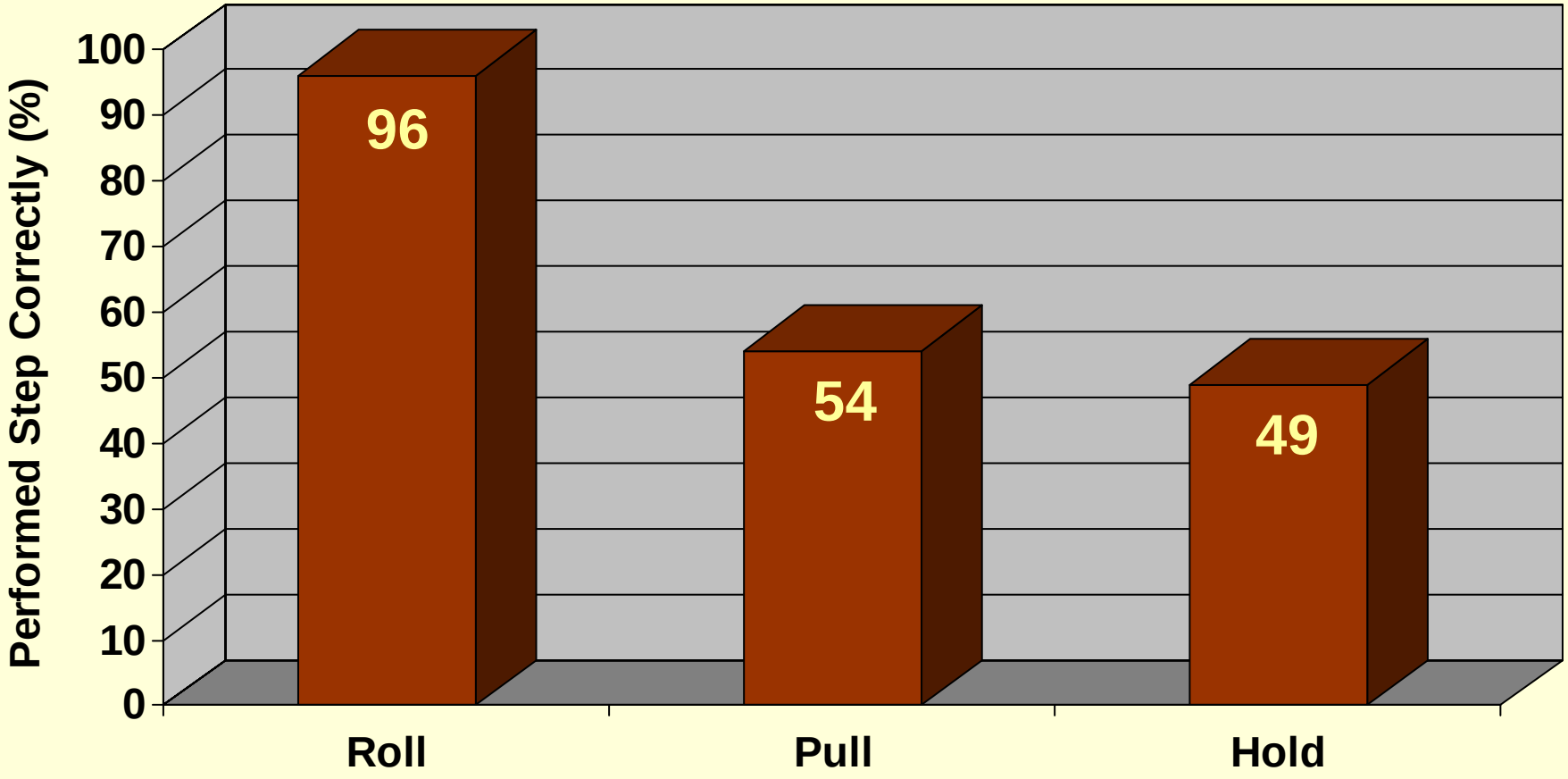


3. Hold the earplug in with your finger—as far as it will go. Count to 20 or 30 *out loud* while waiting for the plug to expand and fill the ear canal. Your voice will sound muffled when the plug has made a good seal.

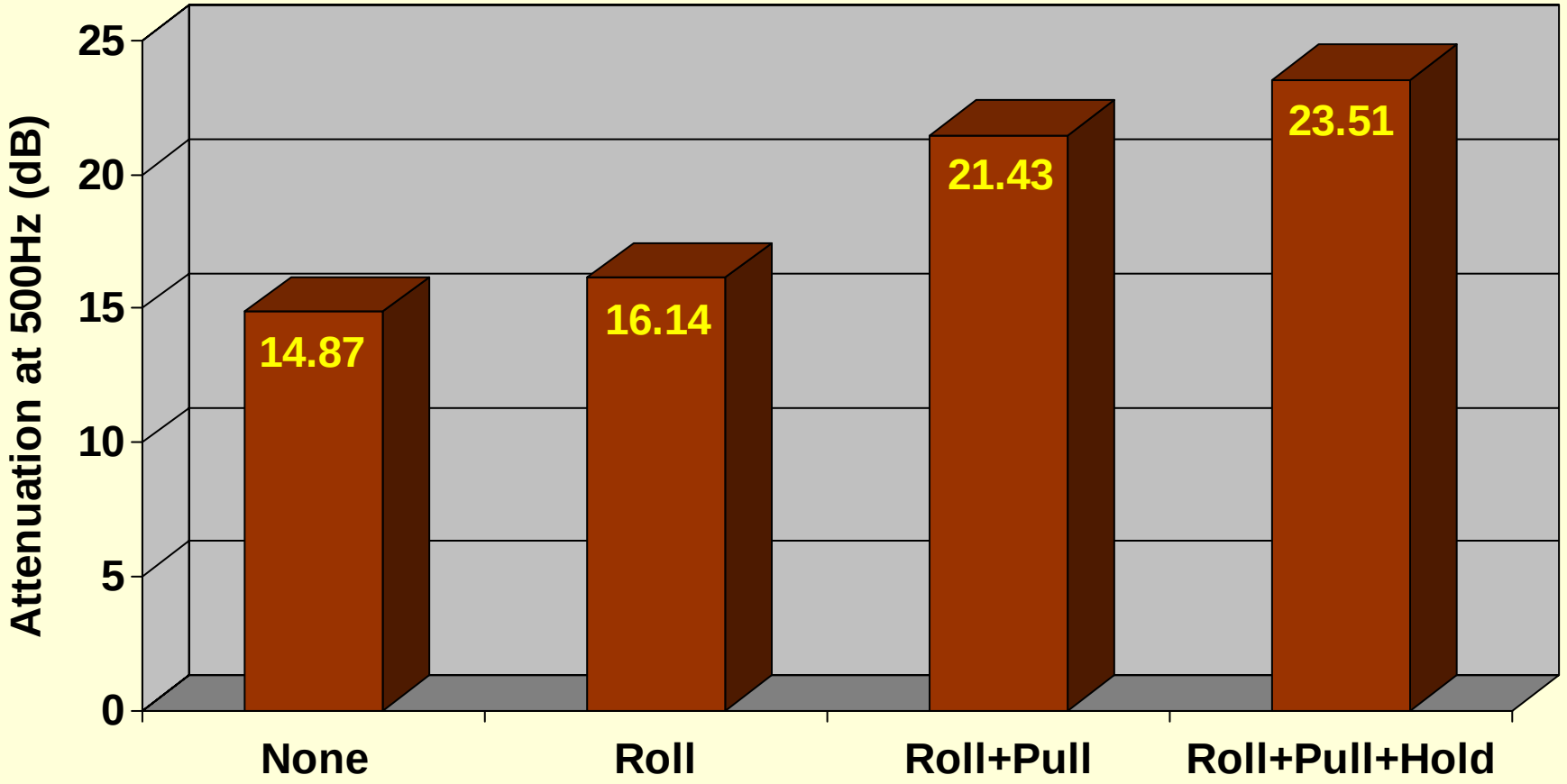
Check the fit when you're all done. The entire foam body of the earplug should be within the ear canal. Try cupping your hands tightly over your ears. If sounds are much more muffled with your hands in place, the earplug may not be sealing properly. Take them out and try again.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
www.cdc.gov/niosh - 1-800-35-NIOSH

Correct Completion of Roll-Pull-Hold steps



Increased earplug attenuation from completing Roll-Pull-Hold steps



Using plug rated at 35.8 dB attenuation at 500Hz

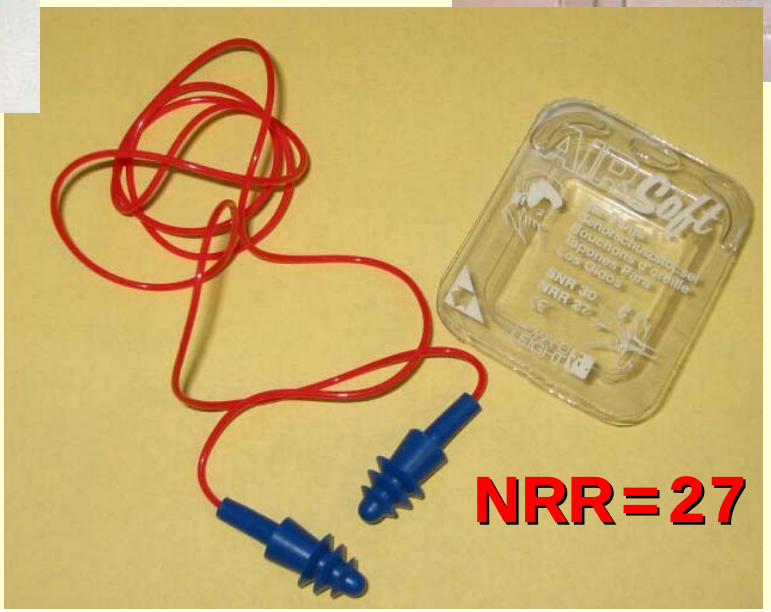
Hearing Protection Devices
Noise Reduction Ratings

- NRR required on all HPD labels
- A measure of hearing protector *attenuation* (noise reduction)
- Determined in a lab with ***open*** and ***occluded*** (protected) ears on trained subjects
- Based on decibel *difference* between the open and occluded hearing thresholds

Noise Reduction Ratings (NRR)

NRR=20

NRR=29



NRR=27

Hearing Protection Devices
Noise Reduction Ratings

- Some people select HPD's by the highest NRR
- ***But*** NRR tends to overestimate real-world protection
- The NIOSH Noise Criteria document (1998) suggests derating:
  - Earmuffs - **25%**
  - Foam plugs - **50%**
  - Molded (flanged) plugs - **70%**
- Derating is still only a rough guide – actual protection can vary

Derating Examples

Muffs:

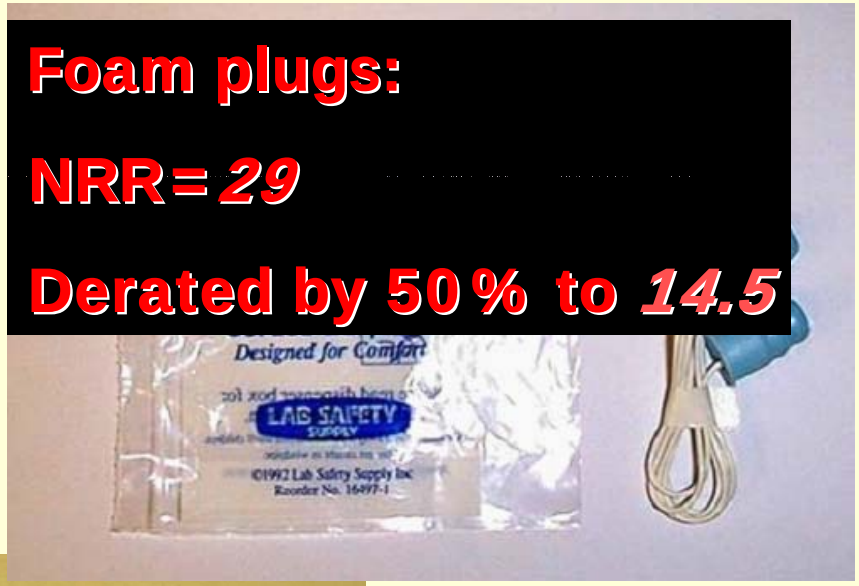
NRR=*20*

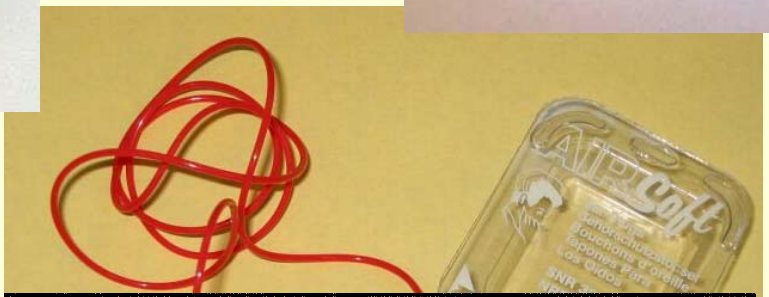
Derated by 25% to *15*

Foam plugs:

NRR=*29*

Derated by 50% to *14.5*





Molded plugs:

NRR=27

Derated by 70% to *8*

Dual Protection

+

Using a combination of ear plugs and muffs.

Recommended for exposures of 8 hours above 100-105dB(A) (time weighted avg.)

- Examples: Roof bolter, underground auxiliary fans, continuous miner, miner/bolter, coal processing equipment
- To compute NRR from dual protection:

  Add **5dB** to the HPD with most protection/highest derated NRR of two selected

For more information

Roberta Hudak

Phone: 412-386-4599 Fax: 412-386-4865

rph4@cdc.gov

www.cdc.gov/niosh/mining

Questions ???

Value the "gift" of hearing--Sounds good to me !!